WOOD'S
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MANUALS

MANUAL

OF

GENERAL MEDICINAL TECHNOLOGY

INCLUDING

PRESCRIPTION-WRITING.

BY

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CHAPTER IV.

CHAPTER V.

PART II.

TECHNOLOGY OF MEDICATING.

CHAPTER I.

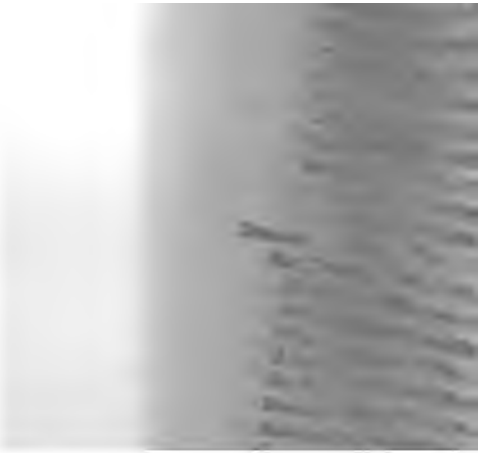
GENERAL

MEDICINAL TECHNOLOGY.

INTRODUCTION.

The study of any group of technical things necessarily takes up the following topics in order: First, the general technicalities of the things as a class; secondly, their individual features; and, thirdly, their practical application in the fulfillment of their purpose. The subject, *Materia Medica and Therapeutics*, then divides itself for study into the three branches of *general medicinal technology*, the *materia medica*, and *general therapeutics*.

Concerning general medicinal technology, this *subject* shows itself two-fold, have *do with the* technicalities of its the *things*, on the one hand, and of their



phates are called respectivel
iron," simply, and "*ter*sulphate
in the case of mercury compoun
an old chemical confusion, chem
wholly thrown aside and an arbi
tive title adopted. Hence mercur
curic chlorides are named, respectiv
and "corrosive chloride of mercu
analogous iodides, "green" and "r
4. With *compounds having a well-k*
scientific name, the same is often
preference to the chemical title.
place of *potassio-aluminium sulphate*
trichloromethane, or *phenol*, we hav
spective officinal titles the more fam
alum, *ether*, *chloroform*, and *carboli*

Concerning, next, the nomenclat
organic drugs, the principles follow
thus succinctly

officinal Latin title, selected according to the preceding rule, is to denote, or stand for, the *part* of the plant directed to be used, provided that only *one* part of the plant is officinal. Examples: *Aconitum*, to stand for Aconite Root; *Conium*, for Conium Seed; *Hyoscyamus*, for Hyoscyamus Leaves, etc. But if more than *one* part is in use, the part is to be specially mentioned in the title. Examples: *Belladonnæ Folia; Belladonnæ Radix; Stramonii Folia; Stramonii Semen.* 3. The officinal English titles are to be the scientific, botanical (genus or species) names, rather than the vernacular names; except in the case of those drugs, where the vernacular names are derived from and [are] still almost identical with the scientific names, or where long custom has sanctioned some other name."

In the Latin titles, where two nouns occur, or a noun and an adjective, the Latin idiom of order of sequence of the words is followed. Hence, *leaves of belladonna* and *purified aloes* are rendered, respectively, *belladonnæ folia* and *aloē purificata*.

Lastly, as to the names of *pharmaceutical preparations*, these are arbitrary, and
sent themselves, seriatim, when we di
forms of such preparations. The on

tinctura, as Latin usage would naturall
but *tinctura opii*. Where adjectives occ
ever, they are put in their proper Lati
following their noun. Thus, *tinctura o*
deodoratus, "deodorized tincture of opium
fluidum gentianæ fluidum, "fluid extr
gentian."

CHAPTER III.

FORMS OF MEDICINES.

THE *forms of medicines* next require consideration, and our study here must be precise, for the products of pharmacy have class-titles and class-peculiarities which must be thoroughly understood by the prescriber. These products are most conveniently grouped for study into those for general and those for special application. Of the former, with solid drugs, the simplest form is the crude drug reduced to *powder*. Pulverization is an obvious prerequisite for the majority of applications of drugs, and where, in a prescription, the powdered condition of an ingredient is a plain necessity, the pharmacist, in compounding, uses the powder without the physician being obliged to specifically order the same. But also certain powders, simple and compound, are among the prescriptions of the Pharmacopœia, constituting thus a kind of preparation, under the title PU'LVIS, *Powder*. Limitations in the use of the powder as a form of medicine are that deliquescent and oily substances do not keep well in that form, a

[illegible] the purpose.
[illegible]ectly possible, however, to emulsi[illegible]
[illegible] by mucilage or yolk of egg, as with
[illegible] in suspension are sometimes,
[illegible]rrectly, spoken of as emulsions, pr[illegible]
[illegible] of their milky appearance. Sus[illegible]
[illegible]ed with pure resins, by tritu[illegible]
[illegible]ilage, and with gum-resins—nat[illegible]
[illegible] of a gum and a resin—by the si[illegible]
[illegible] of water, the gum in the g[illegible]
[illegible]olving to form a mucilage in w[illegible]
[illegible]ticles of the resin then remain in[illegible]
[illegible]sion.

From mixtures and emulsions, whe[illegible]
[illegible]rial is in suspension in a fluid, undi[illegible]
we pass to forms of preparations where
contrary, the thing is in [illegible]

sesamum will
fectly possibl
by mucilage
Resina in susp
correctly, spok
cause of their
effected with
mucilage, and
tures of a gum
dition of wate
dissolving to
particles of th
sion.

From mixtu
terial is in susp
we pass to form

g extra
ing a
ns w
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nalit
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rivilege
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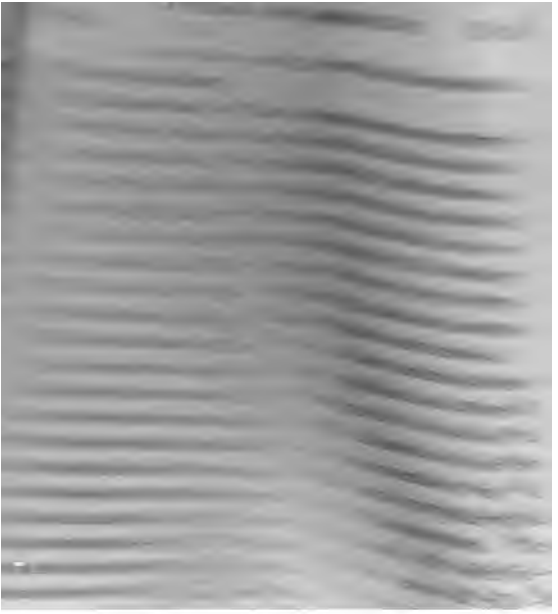
y persons, including obviously the entire
s of *little* children, who constitute so very
e a proportion of our patients. Conven-
, therefore, as pills are, they must not be
cribed with stupid indiscrimination. Al-
t any solid medicine not deliquescent, in
der or as extract, and also many fluids, pro-
d, of course, the dose be small, may be
red to be dispensed in pill-form. Pills
n freshly made are dusted with some dry
der to prevent them from cohering, or are
ed with some material with the view of
ealing taste. For the latter purpose a sim-
and handy process, applicable to small
hes of pills, is to shake the pills, freshly
e and still sticky, in a box with gold or sil-
foil. By this means the pills become
ly coated with bits of the broken foil,—a
ring which fairly enough conceals the taste
yet readily gives way, after swallowing, so
interpose no obstacle to the solution of the
in the stomach. Other substances, so
ly used—sugar, gums, gelatin—require
ial manipulation and even apparatus, so as
e practicably applicable only to the manu-
ure of a considerable number of pills. A
h of a dozen or so extemporaneously p
d pills can therefore hardly, with pr

to the dispenser, be coated with any of these materials. These coatings have furthermore the feature that the time required for their dissolution in the stomach is just so much time lost for the operation of the pill, and if such time be considerable, the pill may slip along the alimentary canal even into the lower bowel, before its own solution begins, and the full absorption of its medicament thus be seriously compromised. Hence, without touching the question of the relative ease of dissolution of these various coatings, it is a good general rule that when speed and certainty of operation are desirable, coated pills (coated otherwise than by metallic foil) had better not be allowed. Besides coatings for the concealment of taste, some pills, because of the nature of their ingredients, require an air-tight casing, as for instance pills containing phosphorus or ferric iodide, substances that easily oxidize on exposure. Balsam of tolu is used for such coating, and the pills thus prepared are open to the same possible objection as just urged against other coated pills.

In *administering* pills, the majority of people old enough to take a pill at all can swallow the little sphere if put far back on the tongue and helped along by a gulp of

prescribed with stupid indis
most any solid medicine not
powder or as extract, and also
vided, of course, the dose b
ordered to be dispensed in
when freshly made are dusted
powder to prevent them from
coated with some material wit
concealing taste. For the latter
ple and handy process, appli
batches of pills, is to shake th
made and still sticky, in a box
ver foil. By this means the
loosely coated with bits of the
covering which fairly enough co
and yet readily gives way, after



rose, "honey
honey impregnated wit
astringency of red rose.
Of late a favorite mode
pharmacists, of catering t
for nauseous medicines
fluid composition containi
drug-principle and a good
sugar, and aromatic favorin
after they have entitled ELI
cognizing the hard fact of
these elixirs, the Pharmacop
thought it no more than fai
legitimate prescriber a ready m
ing with the wholesale mann
field. We find, though

[illegible] the stomach-stomach, then to an alcohol, then the stomach-stomach, then. Medicine is worldly, then, as is the way with climate; under it is tabloid-powder, then, as is the necessity with weak stomachs; but it is taken regularly for a month, as is the rule with "usual" medicines, and then we are surprised if the whiskey-bottle succeeds the chlorophyll on the shelf of the patient's private closet.

To medicate the rectum, vagina, or urethra, we have the simple device of incorporating the medicament with a material, which, while liquefying readily at the temperature of the body, is yet firm enough to admit of being passed bodily, in form of a solid plug, into one of these canals. All such medicated plugs are, generically, entitled suppositories, but, by usage, the word "suppository," unqualified, is taken to mean a rectal plug, while a cylinder for the urethra is specifically styled a "bougie." The Pharmacopœia recognizes only SUPPOSITO'RIUM, *Suppository*, meaning the form for the rectum, and confines itself to general directions for the making, thus leaving the prescriber at liberty to medicate at pleasure. The directions, so far as the physician need *know them*, are that the basis of the suppository *shall be cacao-butter* ("oil of theob

Rectal sup
moulded in the form o
concerning their appli
are that the medication
the cleaner the cavity th
in insertion, the plug n
yond the sphincter.

To medicate the *skin*—
through the avenue of
number of special pharm
here often most suitabl
should be incorporated w
for greasy dressings prote
vent drying, and, more rea
matters, permeate cracks,
unbroken tissue of the ski

[illegible] mod-
ferred, with certain as
ons, by special provision
the place of lard.

The third kind of
basis is peculiar. This
chemical means into wh
one of the former of w
oil, a thin, oily fluid, ha
solution of the fixed oils.
ever solid, can unite with
alcohol, as they are then
with chemical nonessentiali
pose that certain of such
ble in an excess of the acid
chemical metallic bases an

use.

Table of Equivalents.

Apothecaries' and Metric Weights.

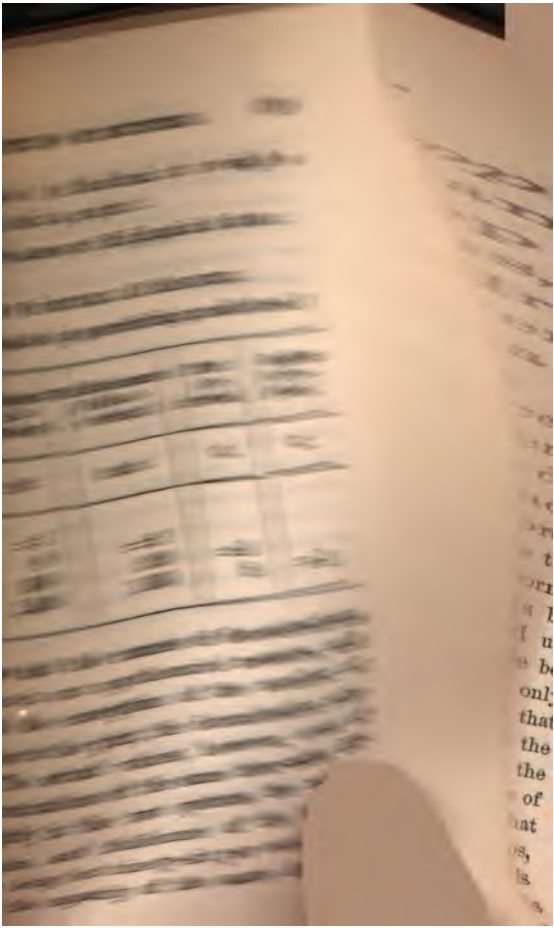
Apothecaries'.	Metric. (Approximate.)	(Exact.)
Gr. $\frac{1}{64}$ =	0.001 Gm.	[0.00101 Gm.]
Gr. $\frac{1}{32}$ =	0.002 Gm.	[0.00202 Gm.]
Gr. $\frac{1}{16}$ =	0.004 Gm.	[0.00405 Gm.]
Gr. $\frac{1}{12}$ =	0.005 Gm.	[0.00540 Gm.]
Gr. 1 =	0.06 Gm.	[0.06480 Gm.]
Gr. 10 =	0.65 Gm.	[0.64799 Gm.]

[illegible]	[illegible]	[illegible]
[illegible] = 3.00 [illegible]	[illegible]	[illegible]
[illegible] = 3.00 [illegible]	[illegible]	[illegible]
[illegible] = 4.00 [illegible]	[illegible]	[illegible]
[illegible] = 30.00 [illegible]	[illegible]	[illegible]
[illegible] = 32.00 [illegible]	[illegible]	[illegible]
[illegible] = 125.00 [illegible]	[illegible]	[illegible]
[illegible] = 200.00 [illegible]	[illegible]	[illegible]
[illegible] = 500.00 [illegible]	[illegible]	[illegible]

Next comes the subject of [illegible] time. This mode of determining quantity is universally used in the domestic dealing of [illegible] and, in the compounding of prescriptions, is employed in substituting gross amounts, as a powder or pill—and, generally, where prescriptions are in the apothecaries' system, in dealing with fluid medicines. The reason is measuring instead of weighing in these cases is purely because of considerations of [illegible] ence, either to the prescriber, [illegible] administrator. For in the matter [illegible] measuration can never compete [illegible] carefully done on a good balance [illegible] properly applied measuring [illegible]

and the
tions of me
are identical wi
and ounce. We
we note that th
pound, is of the
denomination inc
the gallon a new h
no analogue among
ourselves, however,
nominations, as we c
and the numerical re
calculating weights an
here.

These same analogies
strictively suggest
fact betwee



for me
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t. is sa
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is of th

—is, as a
y of the
idounces
ful rates
he *tum-*
but all
rthless

[illegible]

[illegible] *fourteen*, or *sixteen* [illegible]

[illegible] however, it is safest [illegible] as to be [illegible] on the back of the [illegible] given.

[illegible] very vague term—is, as a [illegible] the capacity of the [illegible] about two fluidounces [illegible] The *usual* rates [illegible] fluidounces, and the [illegible] *ten or twelve*, but all [illegible] *size as to be* [illegible] purposes.

s.

[illegible] *should* [illegible] f the [illegible] irect [illegible] dre [illegible] dings [illegible] n [illegible] tim [illegible] subje [illegible] aim [illegible] pur [illegible] *thing* [illegible] *rigle*, [illegible] by [illegible] affluence. [illegible] m, so to [illegible] y, more [illegible] gle rep- [illegible] Notable [illegible] liuretic, [illegible] degree [illegible] otten by [illegible] a kind [illegible] t large [illegible] scrip- [illegible] the

...ples in point
place the reaction may *mak*
difference in either medicinal acti
qualities of the combination presc
fact is often overlooked by syste
combinations are solemnly warned
"incompatibles," solely because a
occurs in the compounding, the
forgetting that the chemical activities
mentary apparatus will often dispose
cipitated substance as quickly as of c
tual solution.

In the third place, however, the reac
make a most important difference, ei
cause the precipitate is difficult of soln
the digestive fluids, and therefore is m
feeble or inert, or

	Solutions of *Alkalies.*	*Carbonic acid* and solutions of *carbonates.*	*Sulphuric acid* and solutions of *sulphates.*	*Phosphoric acid* and solutions of *phosphates.*	*Boric acid* and solutions of *borates.*	*Hydrochloric acid* and solutions of *chlorides.*	*Hydrobromic acid* and solutions of *bromides.*	*Hydriodic acid* and solutions of *iodides.*	Solutions of *sulphides.*	*Tannic acid.*	*Arsenical* solutions.	*Albumen.*
Alkaloidal solutions (generally)........	prec.	prec.		prec.	prec.			prec.		prec.		
Metallic solutions (generally)....	prec.	prec.		prec.	prec.				prec.	prec.	prec.	prec.
Lead solutions..	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.
Silver solutions.	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.	prec.
Calcic solutions.	prec.	prec.	prec.	prec.								
Magnesic solutions........	prec.	prec.		prec.								
Albuminous solutions......										prec.		
[illegible] solutions.....										prec.		

good *terminological* expert!

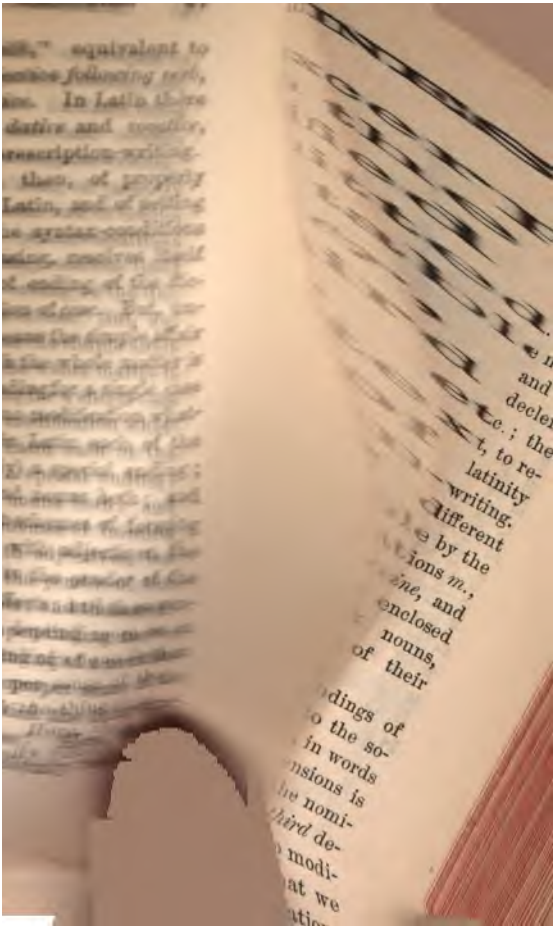
Let us now take a few examples of m
titles and analyze their construction:

Compound extract of colocynth.
Sulphate of quinine.
Powder of opium.

the n

In both these e
entry does not re
the thing, but to
in the one case an
then, the words "
in the objective af
without a preposit
jects" of the verb

Our analysis of I
that we need in th
how, given a nomi
tion for: 1, object
jective case after unt



tical difficulty of lat
thread the labyrint
at we need to know
First, the several s
ndings—the *declensi*
t always the proper
se;" *secondly*, the s
en noun in the no
e the declension to w
and *thirdly*, the syst
ow *genders*, in order
m, by what declensi
eof to inflect any ad
attach to it.

of the *declensions*,
ase-endings. As alre
such, but of these o
ordinary prescription-
example, viz., the abla
se "pro re natâ," m
, "as necessity arise
for dosing. We p
form, but four decle
only the inflection
prescription-writin
number, the nom
and dative; and, in
gender, and

Plural Number.

Nominative..	-ae	-a
Genitive.....	-arum	-orum
Accusative ..	-as	-os

Fifth declension exemplified only in ab

nece
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have
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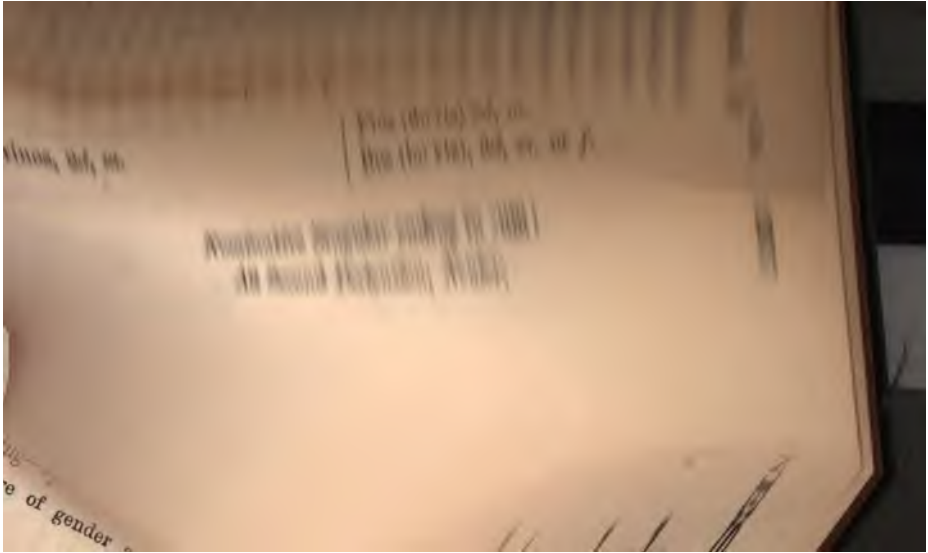


Ending in **s** 1

(*-is*, genitive *-eris*)
Pu'lvis (pu'lveris), *m.*
(*-is*, genitive *-is*)
Ca'nnabis (ca'nnabis), *f.*
Digita'lis (digita'lis), *f.*
Hydra'stis (hydra'stis), *f.*

in *-as*]
)
f.

(*-ax*)
Bo'rax (bora'cis), *m.*
Sty'rax (styra'cis), *m.*
(*-ex*)
Co'rtex (co'rticis), *m.* and *f.*
Ru'mex (ru'micis), *f.*

(*-ix*)
Pix (pi'cis), *f*
Ra'dix (radi'cis), *f.*
Sa'lix (sa'licis), *f.*
(*-ux*)
Nux (nu'cis), *f.*
(*-lx*)
Calx (ca'lcis), *f.*

As to adjectives, we must know their declension, for the reason that, in Latin, adjectives agree with their nouns in gender, number, and case. Adjectives are declined like nouns, and those that concern us in prescription-writing—apart from the numerals *unus*, *duo*, and *tres*, already [illegible]d — are of gender and declension as shown in the following

TABLE

Declension and Gender of Adjectives occurr

al Medicinal Titles and Prescription Phrases

: I.—*Second and First Declensions combined.*

Feminine.

-a [1st dec.] *-um* (-

SCHEME. II.—*Third Declension.*

d Feminine.

itive *-is*) *-e* (ge

SCHEME III.—*Third Declension.*

d Feminine.

ive *-oris*). *-us* (ge

SCHEME IV.—*Third Declension.*

All Genders.

oncerning the schemes thus shown we may e the following: Scheme I. embraces the y great majority of adjectives, and the uter ending *-on* instead of the usual *-um* oc- rs in but a single example, *diachylon.* heme II. comes next in order of membership, ch adjectives as *mitis*, "mild," *viridis*, "green," belonging to this family. In the neuter f this scheme we have examples of words in *-e* of the third declension—words not occurring among pharmacopœial nouns. Scheme III. is a peculiar scheme for declining the "comparative" of certain adjectives, and presents for us but a single example, *fortior* (masc. and fem.), meaning "stronger." Scheme IV. has in our present Pharmacopœia but two examples in *-ens*, *effervescens* and *recens*, and but one in *-or*, *tricolor.* Viewing the schemes together, we see that the nominative-ending carries with it the showing of declension and gender in all cases except that of the ending *-us*, and here we need but to remember that all nominative-endings in *-us* are, in pharmacopœial examples, masculines of the first Scheme, except *fortius.*

So ends, then, the story of the Latin of prescription-writing, with the exception that Latin idiom imposes a different order of words in the sentence from what is the cust

is observed in prescript
such a title as *sulphate o*
Latin have the words reve
ing *of quinine the sulphate*.
is followed in latinized title
cept that where the thing i
preparation, the word signi
preparation—tincture, extra
its dependent, as in English
the incongruity of the titles
der of opium"—a *condition* o
tura opii, "tincture of opium
made from the drug. Thi
jectives follow the nouns the
preceding, as in English:

leaving the matter of *quantities* for future consideration.

We wish to order for Mrs. A. B., a stomach-bitter, and we select the *sulphate of quinine.* Forthwith, then, we set down the phrase "For Mrs. A. B.," and follow it with the order "take of sulphate of quinine"—as yet not fixing the amount. Having got thus far we bethink us in what pharmacal form this quinine-salt shall be given, and we determine upon the fluid form, and that the salt shall be in actual solution. Then occurs the chemical point that quinine sulphate needs the help of an acid to dissolve it in ordinary fluids, and so perforce we must add an acid to our prescription; we elect to take *aromatic sulphuric acid*, and so write next the words [take] "of aromatic sulphuric acid"—a quantity to be determined by the amount of quinine. Next we turn our thoughts to the ingredients to make up the fluid vehicle in which the quinine salt is to be dissolved. This is to be essentially aqueous, but it occurs to us as a desideratum to have it sweetened by a pleasant syrup in proper proportion. We add, therefore, the words [take] "of syrup of almond"—quantity to be about *one-quarter the* whole bulk of the v
The remaining bulk is to be water, b

say [take] "of water of orange flo
quisite quantity, or we may say [
of orange flowers up to the total
the full bulk to be occupied by
or "of water of orange flowers as
be necessary to attain" the sam
Next, pharmacy being here fulfill
mixing of the ingredients, we appe
"mix," and follow with the direc
[it]:—'Teaspoonful thrice daily
ing.'" Then we date and sign the
if we please, order it "not to be re
what is better, we use privately
scription-blanks of our own, havi
wish, "not to be renewed" printe

EXAMPLE I.—

Not to be Renewed.
For Mrs. A. B.

Take, Of Sulphate of Quinine [quantity x],
Of Aromatic Sulphuric Acid [quantity y],
Of Syrup of Almond [quantity z],
Of Water of Orange Flowers [quantity w],
Or, Water of Orange Flowers up to [the measure of] [quantity n],
Or, Of Water of Orange Flowers as much as may be necessary to [attain the measure of] [quantity n].
Mix. Label—"Teaspoonful thrice daily before eating."

C. D., M.D.,
No. 1 First Street.
Office Hours: 8 to 10 A.M., 5 to 6 P.M.
August 25, 1883.

To latinize, we find that the dictionary words for *sulphate* and *quinine* are respectively "sulphas" and "quinina," and our English model shows that both must be, as usual in prescription-form, in the *genitive*. Turning to our table showing guide to declensions, we find "ending in *-as*, genitive -atis, *acetas* (acetatis) and all salt names in *-as*." Evidently sulphas *belongs to* this category, and its genitive there-

...ium the genit
first declension, and thus
quininae. Lastly, observi
we reverse the English s
nouns, and so set down th
ample:

B. *Quinina Sulph*

The next entry, "aroma
offers a *noun*, "acid," with
jective, "aromatic" and "
then, with the word for "a
regard to *gender* as well as d
to know how to dress the adj
tionary gives for "acid," *aci*
declares all nouns in *-um* to
declension

—we look to our table of declension-schemes of adjectives, and find that adjectives of *-us*, in the masculine, make their neuter in *-um* of second declension. Our adjectives then are, in nominative, *aromaticum* and *sulphuricum*, but since they must follow their noun not only in gender but also in case and number, we must, in our prescription, turn these nominatives into genitives singular to obey the condition imposed by genitive singular noun *acidi*. So, then, *aromaticum* and *sulphuricum* being forms in second declension, exactly as *acidum* itself happens to be, make, like acidum, genitive in *i*, and so become respectively *aromatici* and *sulphurici*. Then, as to order, adjectives in Latin follow their nouns, and the one of closest relationship takes precedence. The English order, then, suffers exact reversal, and the line must read:

Acidi Sulphurici Aromatici .....

Next is the entry, "of syrup of almond," a phrase presenting two nouns in the genitive. "Syrup" is *syrupus*, and our table shows nouns in *-us*, with a few exceptions, to be of the second declension. "Of syrup" then becomes *syrupi*. "Almond" is *amygdala*, which, ending in *-a*, like *quinina*, plainly is of the first declension, and makes genitive

low its leader. So we do no
down:

Syrupi Amygdalæ .

Of the last entry, the first f
of orange flowers," which in l
pressed *of water of flowers of ora*
in the genitive, and one of t
in the *plural* number. *Aqua*,
as we may now divine without
tables, *aquæ* for its genitive.
flos, and the table of endings c
of the third declension, genitiv
the genitive *plural*, we revert
declensions, and find the endi
ally, *-um*, to be applied to the
The root of

teaches us at once will make positive sense. For the order of words, we note first that we have again a pharmaceutical preposition, so that *aquæ*, by right of *ablat.*, comes first; but the pair of nouns "*of flowers of orange*" must be have with true latinity and range themselves "of orange [the] flowers," as, indeed, is in this case the common English idiom. The first-form reads:

Aquæ Aurantii Florum.....

The second form of the same entry is "water of orange flowers up to [the measure of]." Here *water* becomes the immediate "object" of the verb *take*, instead of being, as before, a dependent upon the word for quantity. The case, then, must no longer be *genitive*, but *accusative*, and so from our declension-table we derive the accusative form *aquam* which we must substitute for "*aquæ*." Next, the new form presents the phrase "up to [the measure of]" for rendering into Latin. Turning to our table of odd words we find the preposition *ad*, signifying "to," or "up to." The whole phrase then becomes:

Aquam Aurantii Florum, ad.....

wherein the words "aurantii" and "florum" *suffer no change*, for, of course, the phrase is *still "water of* flowers *of* orange."

ter is, as at first, again [illegible]
novelty of the form is the introdu
phrase "as much as may be neces
For the translation of this our t
phrases may be appealed to again,
the set phrase *quantum sufficiat*, r
much as may be necessary." Ther
found preposition *ad*, "up to," co
phrase, and the line in its third for

Aquæ Aurantii Florum, quantum s

But the phrase "quantum suffic
set phrase of common occurrence
under such circumstances, *abbrev*
expressed by the initial letters
words, thus—*q. s.* The abbreviat
actual usage will then be:

with a sweet
ne. But for
revious exam
of all the in
mar process w
emulsifier
when em
then, may
ingredients
in the
detail
for
EXAMPLE

aim of the prescription and so conti
bing of the oil and the egg-yolk
emulsion is formed. To translate
castor-oil" is, structurally, "of oil
—*oleum* is "oil," which we know e
to turn at once into genitive *olei;* an
tor" we have, in officinal nomenc
genus-name of the plant furnishi
namely *ricinus*. And *ricinus*, being
mense majority of nouns in *-us* are,
ond declension, gives us for "of
genitive *ricini*. In order of words
ing, practically, a *preparation* agai
lish order "oil of ricinus" obtai
entry appears:

℞ *Olei Ricini*

the form

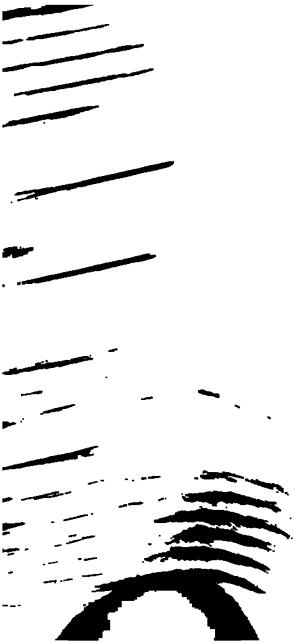
d before :
o the ta-
d cited as
nitive *li-*
ses :

curred

ree, is

of odd
udde,
next

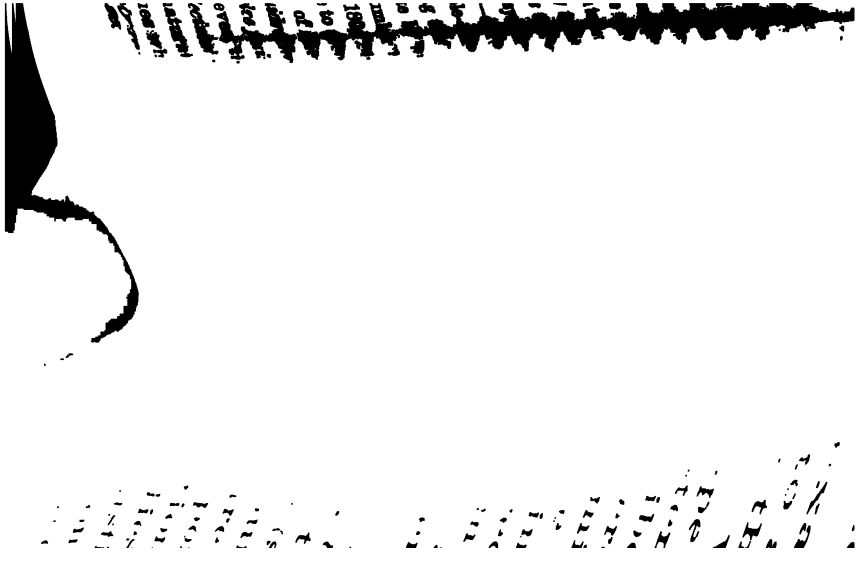
Fol-
our
lum
ther
Aide



Ruby
Oh as
Pills.
le
into
—time."
O. P.,
No. 4 Fourt
4 to 5 P.M.

ession "powder
before the offici
eing this: *Purife*
rhubarb is a root
ody such matters
irst undergo
ticle th

to be just a bottleful
reasons of convenience
perforce select a total
such measures. Now
round numbers that we
our totals by, *will diffe*
of the system of weight
ploy. Thus, in the apo
lation of the denomi
the comparatively less-
on a *duodecimal* basis.
therefore, we naturall
bearing a simple ratio
2, 4, 6, 8, 12, 18, 24,
and hence medicine-ph
apothecaries' measure



to
rea
per
sue
rou
our
of
plo
lati
the
on
the
bea
2, 4
and
apo

a half fluidounce, which makes the whole
hteen minims too much, but direct that
ter be "taken" *until the whole mixture shall*
brought to the final full measure of two fluid-
nces. Now, then, the pharmacist, having put
to his graduate, or into the two-ounce dispen-
ng-phial the three first-named ingredients,
mply fills up to the two-ounce mark on the
aduate or to the neck of the bottle, with the
ange-flower water. This procedure is evi-
ntly to be commended, as it is more accurate
the one hand, and its working is handier on
e other, both to prescriber and compounder.
llowing such method, the last entry will then
pear thus:

Aquam Aurantii Florum ....ad f ℥ ij.
Aquæ Aurantii Florum..q. s. ad f ℥ ij.

Of these two forms, both of which mean pre-
ly the same thing, the latter is perhaps the
re advisable, since the introduction of the
reviation *q. s.* calls more especial attention
the nature of the order. In both forms, the
quid, be it observed, now appears as *two*,
[illegible] as before, *one and a half* fluidounces,
hough it is practically even less than
half fluidounce that is taken; bu
[illegible] "the phrase, "up

basis, gr. j.

℞. Quininæ Sulphatis ....
Acidi Sulphurici Aroma
Syrupi Amygdalæ ....
Aquæ Aurantii Florum
(*Or*, Aquam Aurantii Florum
(*Or*, Aquæ Aurantii Florum.

[*Metric System:* 10 *teaspoonf*
0.05 Gm.]

℞. Quininæ Sulphatis .....
Acidi Sulphurici Aromati
Syrupi Amygdalæ .....
Aquæ Aurantii Florum .
M. S.—"Tablespoonful

orange and spearmint water—we arrive at our amounts as follows: This mixture, being a purge, is required in but single dose, and the total bulk hinges directly, then, on the dimension of the single dose. Now, Mr. E. F. is a big hard-working man, and will probably take a full measure of the oil; so we will make our mixture to accord with a full dose of castor oil, although, for safety's sake, ordering only one-half to be taken at once, reserving the other for a possible repetition. Now a full dose for a hearty man is of this oil from a tablespoonful to a tablespoonful and a half, the dosage having considerable range. To emulsify we shall need of egg-yolk *about* one-half the amount of the oil, and, for a pleasant further dilution, shall want of the diluent between one and two measures of the emulsion. In all the amounts, from the nature of the case, there is a good deal of latitude. Starting with the amount of oil, and computing first in the apothecaries' system, a quantity of a fluid which shall be somewhere between one and one and a half tablespoonfuls is most naturally fixed to be *one fluidounce*. Then half that amount of yolk of egg will be half a fluidounce, which happens to be *just* about the measure of an average *single yolk*. Having thus a fluidounce

the range of advisal
same. So we order of the e

℞. *Olei Ricini* .....
Vitellum Ovi unius

Of the two and a half fl
cupied by the diluent, we
half to the syrup and the
taking but a small proportio
of the viscidity already p
emulsion. So we write for t

Syrupi Aurantii.....
Aquæ Menthæ Viridis...

Or, if we are pursued by a
tude, remembering that the y
turn out precisely

capacity of the average modern tablespoon), and the yolk of one egg in its entirety being handy to take, we will allow the same, although somewhat more than half the measure of oil. Estimating such yolk at fifteen cubic centimeters, this with the oil gives a total bulk for the emulsion of forty cubic centimeters. And at once, for the amount of diluent, the quantity *sixty* cubic centimeters suggests itself, a quantity which will bring the whole to the even measure of one hundred cubic centimeters; and this measure of sixty we will apportion by giving fifteen to the syrup and forty-five to the water, giving us a proportion in the neighborhood of that obtained in the prescription by apothecaries' measure. To order these several volumes, now, in terms of weight, the first substance, oil, is one-tenth lighter than water, but as the dosage is so indeterminate, the error of disregarding the difference of specific gravity is of no practical moment whatever. Still, if we prefer, the needed allowance is made without the slightest difficulty; twenty-five less one-tenth is twenty-five less two and a half, or twenty-two and a half. We order, therefore, for the emulsion,

℞. *Olei Ricini*.....22.50
Vitellum Ovi unius.

EXAMPLE D

[*Apothecaries'*

℞. Olei Rici

Vitellum

Tere bene simu

Syrupi Aur

Aquæ Ment

(*Or*, Aquæ Mentl

[*Metric Syster*

℞. Olei Ricini...

Vitellum Ovi

Tere bene simul

The third of our examples was for lemon-flavored citric acid, to be dissolved in water to the strength of ordinary lemon-juice, and then neutralized with potassic carbonate. Here our data for computing amounts are that we want about *five or six doses*; these of *tablespoonful* dimensions; that a proper strength of the potion is afforded by operating upon a *six per cent. strength of acid solution*—which is about the acid strength of average lemon-juice; and that about a *one-tenth of one per cent. impregnation with oil of lemon* gives the desirable degree of lemon-flavor to the solution. By the apothecaries' system we have *four fluidounces* as the average measure of *six* tablespoonfuls, and so we fix the first item, the totality of the prescription, at that figure. The next step is to find six per cent. of four ounces, which will be the amount of acid required—a clumsy problem in the apothecaries' system, but which we solve thus: *one grain* is the *one-four-hundred-and-eightieth* of one ounce; suppose it were the *one-five-hundredth* and it would be just the *one-fifth of one per cent.* of an ounce. Then *five grains* would be *one* per cent. of an ounce, and six times five, or *thirty*, would be six per cent. Then, further, if *thirty* grains be six per cent. of *one* ounce, *four times* thirty—one hun

For Miss M. N.

System: 20 *pills*

ingredient.]

Hydrargyri,

] Aloës Purificatæ,

] Rhei .....

.....

20 *pills* @ 0.05 *G*

gredient.]

Hydrargyri,

] Aloës Purificatæ,

] Rhei .....āā 1.

..... q.

no. xx. divide.

mass in pilulas no.

O. P., M

No. 4 Fourt

A.M., 4 to 5 P.M.

the amor

size an

the Phar

which the patient is likely to require for the present need. Assuming by the outlook of the case that the medication will probably have to be kept up for a week or two, and observing that six pills are used a day, the number *five dozen*, an allowance for ten days, suggests itself as a convenient round number to order. The prescription then becomes:

EXAMPLE V.—

For Miss Q. R.

℞. Pilulas Ferri Compositas..... no. lx.

S.—"Two pills, thrice daily."

S. T., M.D.,
No. 5 Fifth Street.

Office Hours: 9 to 1.
August 29, 1883.

In the next example we want everything the same as in the last, except that the dose must be somewhat less—somewhere between two-thirds and three-fourths of the foregoing amount. We can accomplish the result easiest by giving fewer pills a day, but we can also, if we choose, preserve our method of giving two pills thrice daily by simply having each pill of but from two-thirds to three-fourths the pharmacopœial weight. For it so happens tha particular mixture the pharmacist, for y

Pharmacopœ
ouperial pill weig
grains; in metric,
sixty pills of stand
thus, cuts up a pil
(180 grains), or, roug
grammes. Let us o
but *two-thirds* this w
the same sixty pills,
diminished pill we see

EXAMPLE VI.—

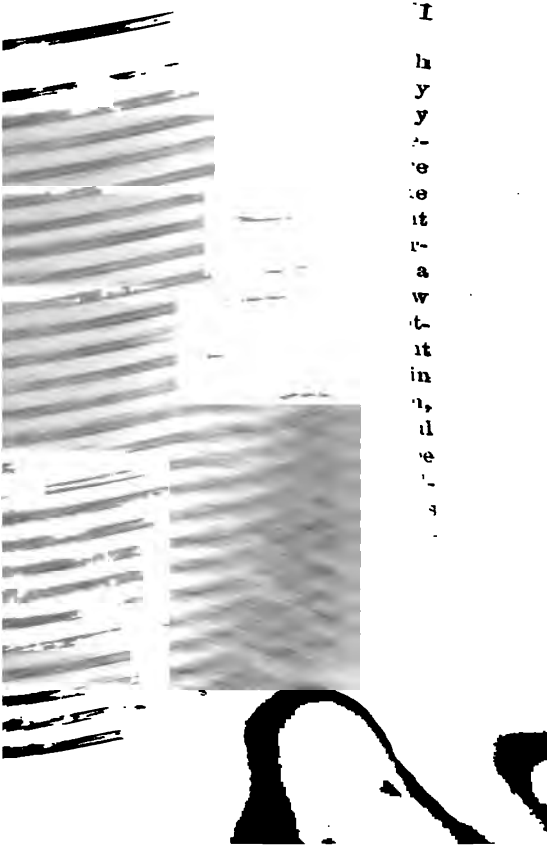
For Miss

[*Apothecaries' System*.

℞. Pilularum Ferri Co

In pilulas no. lx. divid

[*Metric Sy*



℞. Argenti Nitratis .....
Aquæ Destillatæ .....

[*Metric System:* 4 *per cen*

℞. Argenti Nitratis .....
Aquæ Destillatæ.....
Solve et S.—"For external

No.

Office Hours: 2 to 4 P.M.
August 29, 1883.

These seven examples suf
the ways in which the da
amounts in prescribing c

ler these conditions, knowing *about* how much basis we want for a dose, and *about* how many doses we are likely to require, what ready method is there for finding what round aggregate of basis to what even bottleful of mixture will give to the right number of spoonfuls the right amount of dose? To illustrate: we want to give, in fluid mixture, ten or a dozen four- or five-grain doses of some stuff—how big a bottleful shall we base our prescription on, how big a spoonful shall hold our dose, and what bottleful and what spoonful will give a convenient round total of basis for a four- or five-grain charge per spoonful? To solve the problem, the first point to attack is the size of spoonful to take the dose of basis. If the basis is to be in *solution*, of course the factor of degree of solubility has a prime bearing; but assuming this not to stand in the way, then the next consideration is that, in *administration*, the strength of solution had better be limited to (round numbers, apothecaries' weight) *ten grains*, or (round numbers, metric weight) *fifty centigrammes* to the *teaspoonful*, and, to the *tablespoonful*, four times these weights, viz., *two scruples* and *two grammes* respectively. And in practice we even prefer—of cou[illegible] *peaking in a very general way*—to

the concentratio
tered, and consti
prescribing only
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obviously may b
bility of the basis
much more conc
limits, with the u
properly diluted
thus of the first poi
data of *dose of basis*
of spoonful, to get t
of mixture and of b
fulfil the requiremen
hand, and offer round
of prescribing

TABLE SHOWING NUMBER OF AVERAGE SPOONFULS TO ROUND METRIC VOLUMES.

Teaspoonfuls.	Tablespoonfuls.	Cubic centimetres.
5	--	25
10	--	50
20	5	100
40	10	200
50	--	250
60	15	300
80	20	400
100	25	500

In the table only those equivalents are given which are likely to be calculated from in actual practice. To illustrate the application, let us assume that we want somewhere about a dozen or so doses of somewhere between eight and twelve centigrammes of a thing to be given in fluid mixture. From the smallness of the dose we naturally select a teaspoonful rather than a tablespoonful for the measure of vehicle to hold each of the same. Then referring to the table and seeing that a fifty cubic centimeter measure offers an aggregate of ten teaspoonfuls, we at once select such total for our mixture *and calculate* the total of [illegible] *scheme of* ten doses. And in such [illegible]

℞. Argenti Nitrat
Aquæ Destilla

[*Metric System:*

℞. Argenti Nitrati
Aquæ Destillat
Solve et S.—"For

Office Hours: 2 to 4
August 29, 1883.

These seven exam
the ways in which
amounts in prescri

CHNOLOGY.

elf.

= 90-grain "

per oz. solu

ternal use."

Y. Z., M.D.

No. 7 Seventh

P.M.

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a basis is given

common cond

a exact bottle

t the dose

nal spoonful

mention, and

that obtains with mo
spoonfuls and *one an*
the fluidounce. But
old-fashioned small-si
or if the patient use
glass, then the calcu
scheme of *eight* teaspo
fuls to the fluidounce
teaspoonful as a fluid
ful as half a fluidoun
on p. 177 applies ins

These tables are o
until the beginner,
member, as he soo
the combinations.

TABLE SHOWING THE NUMBER OF FLUIDRACHMS AND HALF FLUIDOUNCES TO ROUND APOTHECARIES' VOLUMES, AND THE AMOUNT OF BASIS TO YIELD TO THE FLUIDRACHM AND HALF FLUIDOUNCE DOSES, SEVERALLY, OF 5, 10, 15, 20 GRAINS.

Fluidrachms.	Fluidounces.	Total of basis, in order to give to the fluidrachm, severally—			
		Five grains.	Ten grains.	Fifteen grains.	Twenty grains.
4	½	ʒ j.	ʒ ij.	ʒ j.	ʒ iv.
8	1	ʒ ij.	ʒ iv.	ʒ ij.	ʒ viij.
16	2	ʒ iv.	ʒ viij.	ʒ ss.	ʒ xvj.
32	4	ʒ viij.	ʒ xvj.	℥ j.	....
48	6	℥ ss.	℥ j.	℥ iss.	℥ ij.
64	8	ʒ xvj.	....	℥ ij.	....
96	12	℥ j.	℥ ij.	℥ iij.	℥ iv.

Half Fluidounces.	Fluidounces.	Total of basis, in order to give to the half fluidounce, severally—			
		Five grains.	Ten grains.	Fifteen grains.	Twenty grains.
2	1	gr. x.	ʒ j.	ʒ ss.	ʒ ij.
4	2	ʒ j.	ʒ ij.	ʒ j.	ʒ iv.
8	4	ʒ ij.	ʒ iv.	ʒ ii.	ʒ viij.
12	6	ʒ j.	ʒ ij.		
16	8	ʒ iv.	ʒ viij.		
24	12	ʒ ij.	℥ ss.		

TECHNOLOGY O

CHAPT

MODES OF M

THE possible effects of
kinds: First, the effects
which the medicine come
directly by virtue of suc
ondly, indirect *consequen*
appearing, it may be, ev
either as nervous reflex ph

parts, viz., how to touch with a medicine the *surfaces* of the body, and how, on the other hand, the *underlying tissues*.

Beginning with the surfaces, the *skin* is so obviously accessible to any mode of medication that but few technical points present for discussion. It needs, indeed, but to be pointed out, first, that the skin being, as compared with mucous membranes, insensitive and poor at absorption, comparatively strong and extensive applications can be made upon it, even of poisonous things. Yet, as will be seen in detail further on, the skin *can* absorb, so as to charge the blood with the absorbed thing to a dangerous or even a fatal degree. Powerful medicines, and especially those that combine the qualities of *potency*, *volatility*, and *high diffusion power*, as for instance *carbolic acid*, must therefore not be applied to the skin too strong, or too extensively. Secondly, it must be remembered that the skin is an organ, having physiological functions; and that applications of a kind and extent to interfere seriously with the performance of such functions are for that reason inadmissible. The persistent covering of nearly the whole of the skin with an *impervious* layer of ointment—even if the *ointment* be in itself innocent—is there

ferent mucous membranes. Some, by the conditions of their functions, must normally suffer touch from without, while to others, foreign touch is obnoxious. The former must necessarily be insensitive, while the latter, finding a safeguard in sensitiveness, may be exquisitely tender. And, of course, the present interest in these facts is the plain indication that, in medicating, applications to mucous membranes must be proportioned in strength to the natural sensibility of the part touched. The most sensitive mucous surfaces are those of the *cornea*, the *upper* portion of the *nasal cavity*, and the *larynx;* next come the general surface of the *conjunctiva*, the *air-passages* beyond the larynx, the *middle-ear*, the lower portion of the *nasal cavity*, and the *urethra;* while least sensitive are the mucous coverings of the *alimentary canal* and the *female generative organs*.

Of the means of reaching these various parts, we note that the *conjunctiva* is immediately accessible; the only technical point to make being that to secure thorough application to the retro-tarsal fold, the upper lid must be fully everted, while the patient is directed to look strongly downward. Otherwise the very part that in conjunctival diseases most needs medicinal touch will escape the application altogether.

in all directions, which nozzle can be applied to any form of syringe. The *Davidson* type is convenient, but handier yet is a rubber bag with long, flexible rubber tube ending in the nozzle, and armed with a stopcock of simple device. The bag is filled with the injection, then hung against the wall on a nail three or four feet above the level of a seat. The nozzle is inserted, the patient, of course, sitting over an ample receiving-vessel, the stopcock is turned, and gravity determines a steady flow of the injection, the *force* thereof being greater the higher the bag is hung. During a vaginal injection the nozzle should be rotated from side to side and withdrawn and pushed up from time to time, so as to secure irrigation of all parts. More certain for this end, although more inconvenient, is the plan of having the patient on her knees and elbows during the injection. In that position the walls of the vagina tend to fall asunder, and the injection thus more surely reaches every point of surface. The vagina can also be reached by vaginal suppositories or medicated pessaries, or by instrumental appliances under exposure by a speculum.

Th[illegible] can be injected, but at great risk of l[illegible] [illegible]ection escape into the peritoneum

of such kinds that are of
respiratory remedies. *Fl*
be inhaled, of course, if
there is much reason to
penetrates very far beyond

The *bladder* can be rea
through the urethra; and
injection, by the insertion
of cacao-butter (urethral
passing of a sound smeared
ment. The instruments an
required are again, as in th
ynx, too special to attempt
ally. The urinary passage
case of certain volatile oils
copaiba and cubeb

this cavity are made by spe
means.

The *stomach and intestines*
swallowing, or, so far as conc
by the *stomach-pump*, an app
ible tube to reach down the a
cavity of the stomach. By a
valves, fluids can be pumped
well as the organ's previous
out. In medicating the al
must be remembered that
ture's greedily *absorbent* surf
majority of things put into t
effect cannot be prevented
their way into the blood.
however, either because of

The *rectum* may be medicated by suppositories or by injection. In giving a medicinal enema the points should be observed to first inject plain water in sufficient volume—a pint or more—to thoroughly wash out the cavity from fecal matter. This injection having been discharged, with its washings, the bowel is given a short rest and then the medicated enema *slowly* injected. And such enema should be of small bulk—not over two fluidounces, and blood-warm, so as not to excite the bowel to its expulsion. On withdrawing the nozzle the fingers or a napkin should be pressed against the anus for a few seconds, and the patient, if old enough to understand, cautioned to resist any inclination to strain. In practising any rectal injection the points should be observed to have the nozzle *warm* and *well greased*, and to pass it, after it is once engaged within the sphincter, *upward* and *backward*, following the concavity of the sacrum. The passage should be slow, and, with a crying child, the pressure should be exerted only during the *inspirations*, when the abdominal walls are relaxed.

In thus running over the special means of medicating the mucous membranes, a *fine spray of fluid* has several times been mentioned. This condition of a fluid medicine is a valu

liquids thoroughly and
slop. Fine spray is c
based on the following
rather narrow tube witl
fine orifice have the oth
in a vessel of fluid. Th
angles to, the free fine
similar fine orifice of a
which from behind a stro
can be driven. By the p
by such blast the fluid fro
up the first tube and appe
thereof. But no sooner d
itself than it is at once li
by this same blast through
in short, dispersed

the intermittent action of the terminal sphere. Or, should an intermittent blast only be wanted, the mid-sphere may be opened and the blast will now only take place during the continuance of the pressure. Where a prolonged application is needed, as in spray-inhalations, the blast is most conveniently obtained by steam from a small boiler, special apparatuses for such end having been devised under the name of *steam atomizers*.

To apply medicines to parts beneath the surface, meaning all parts of the body save skin and mucous membranes, we can for a few special purposes inject into another or into certain cavities, but in the overwhelming majority of instances we medicate all underlying tissues by putting the medicine by some means into the *blood*, thus, as it were, shipping it to those destinations through that universal system of communication. [illegible] a consideration which [illegible] medication. [illegible] can there, [illegible] to the part [illegible] shall bring [illegible] blood [illegible]

whole blood-supplied orga
blood, and thus perhaps s
result over one part at the
able annoying derangeme
unfortunate, of course, bu
and all we can do is to giv
drugs of similar therape
happens to work the max
tic effect with a minimum
disturbance.

Now to *get* a medicine i
are a variety of ways. Th
ral, and therefore commo
low nature's course in geti
the blood, namely, to let t
lowed, and so be absorbe

still, for many reasons, the stomach may be objectionable or even absolutely unavailable as the avenue through which to enter the vascular system. This same deranging tendency of drugs just spoken of may, and frequently does, show itself locally upon the stomach, and loss of appetite, or nausea, or even vomiting, may be the cost of forcing a drug into the system by this means. Or even if the medicine be, by rights, innocent of such tendency, the stomach may be in such morbid state from disease that even normally wholly harmless things, like ordinary foods, upset it, and are not to be borne. Or, because of corrosive poisoning or stricture of the œsophagus, the organ may be absolutely disqualified for use; or it may be practically so because its absorbing capacity is in abeyance from inflammation of its mucous membrane, from narcotic poisoning, or from general collapse of all vital powers when life is at low ebb from serious disease. Thus when an individual is in profound coma from opium-poisoning or is in the collapse of cholera, absorption by the stomach stops, and it is *worse* than useless to thrust drugs into the *paralyzed organ* with a view to their absorption. Or, though the stomach may bear a d[illegible]ly well, and its functional activity [illegible]

chemically attack the tissues
our purpose, or the mere
arising from the presence
with which the drug meets
upon swallowing, may so
as to be of serious cost.
gastric cull is urgent and
both *prompt* and *full* is im
risk the uncertainties of t
fer other methods.

Now, when, for any of t
seek other methods, the
after the stomach is the
medication by enema or s
common. But apart from
venience, and it may

monly, in the first place, administer twice as much as we would give by the stomach, and we see to it that the substance is either dissolved or is in condition to undergo easily simple aqueous solution.

Besides the rectum the lungs afford another natural avenue of approach to the vascular system, and, inherently, they possess the advantages of high speed and thoroughness of absorption. But, obviously, the medicines that can be given by inhalation are limited to such as are highly volatile, and at the same time respirable. *Nitrogen monoxide* gas, *ammonia*, and certain volatile ethereal fluids, such as *amyl nitrite*, *ether*, and *chloroform*, are pretty much the only things given by this method.

Next, we can avail ourselves of the *skin*, and in a variety of ways. Certain easily diffusible substances, in solution, will be absorbed through the sound skin if only laid thereon, by wetted cloths, but such means is so crude, and dosage so uncertain, that the procedure is nowadays rarely resorted to.

A method of determining absorption through the skin that is, however, much used and with
ntage with the particular drug *mer-*
preparation, carrying the

soluble compound, into
medicines also can be int
such as for instance the
majority of these can be g
dermatic injection, this n
as it is called, is, with the
Then—again practically
tions of mercury—the drug
the vapor allowed to cond
when absorption will ensu

Next, passing from natu
medicines into the blood
through surgical procedu
first place, by appropriate
vein with the nozzle of a s

less severe, is to raise a small blister upon the skin somewhere, remove the separated epidermis, and upon the raw surface beneath lay the medicine—necessarily one not severely irritant, capable of easy solution, and requiring but small dose. This method, the *endermatic*, has, however, been entirely superseded by the far better, though physiologically similar, method by subcutaneous or *hypodermatic* (barbarously miscalled *hypodermic*) injection. This is simply to pierce the skin with a fine and sharp nozzle of a small syringe, and then inject into the loose subcutaneous connective-tissue the medicine—of course in solution. From the purely physiological point of view this is the best method of all. Absorption is rapid, thorough, and almost invariably certain, under all conditions and circumstances of the patient's morbid state; derangement of digestion is reduced to a minimum, and, with some drugs certainly, the therapeutic effect is more intense, or more persistent, or even, as with morphine over neuralgic pains, more *radical*, than where the same drug is administered by other methods. Because of these great [illegible]ges the hypodermatic syringe is as un[illegible]
with the practitioners of [illegible]
cet with our fathers, [illegible]

and abscess at the seat of
Again, if a solid, the drug
reasonably bland fluids,
alcohol and water, glyceri
tions of mild salts; and,
thing whose *dose* is small
of the injected fluid not
centimeters (thirty minim
than this measure is to
again, the procedure itself
jectionable. Simple tho
nificant though the pain,
and excitable women and
being stabbed, though
terrifying. Then, excep

be begun, and if so, it will be the particular form of this enslaving vice that will work most damage and be the most cruelly hard to break away from. The dainty poniard of the "hypodermatic" is then not always the boon that many young practitioners of to-day—to judge from their freedom therewith—would seem to consider it.

To *give* a hypodermatic injection, first have a *good syringe*. The piston should work easily and evenly and without leakage, which it probably will *not* do if the cylinder be of *glass*, but *will*, if it be of silver, celluloid, or—if the workmanship be good—of hard rubber. There must, next, be a *graduation* somewhere to tell the amount injected. This with glass cylinders may be on the cylinder itself, but with instruments made of opaque material must necessarily be on the piston. In the latter case there is commonly a small screw-collar on the piston, which, by setting at the proper mark, stops the piston from going beyond a certain distance, and so limits the amount of injection possible to deliver. On purchasing a syringe the graduation should be tested for accuracy before trusting to its possible false showings. *The needle* should be clean, sharp, and free from rust, conditions best maintained by

rather than coarse.

Having thus a good sy
good solution. No *dirt*, n
no *free acid* must find pl
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that fluid are therefore the
istration by the hypoderi
solution is better made fr
water fresh from a tap is l
therefore almost certainl
water. If solutions be k
to be salts of alkaloids, th
with some preservative,
chloral, carbolic acid, sali

of *gelatin* or of *sodic sulphate*, the salt in the latter instance being given form and cohesion by powerful pressure. These medicated tablets, if of reliable make, are exceedingly convenient, the compressed tablets of the sodic salt especially so, provided they are fresh enough to dissolve readily.

Being ready with a good syringe and a good solution, we fill the one with a sufficiency of the other, then hold the syringe vertical, needle-end up, and gently push upon the piston until fluid appears at the needle-orifice. Thus the bubble of air, which it is practically impossible to prevent from having place within the cylinder, is discharged, and we are now certain that the syringe is just as full of solution as it purports to be. We next *fix the dose* beyond possibility of misadventure by observing where the piston stands in relation to the graduation upon its shank, and by then running down the screw-collar so far that on driving the piston home as far as the collar will allow it to go we shall inject just the desired quantity. Then a fold of skin is pinched up with the fingers of the left hand, and into the triangular slope trending downward from between the fingers the needle is quickly plunged, in direction carefully parallel to the surface of

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are preferred where the sk

dose by the hypodermatic method should invariably be less, even by one-half, than that which would be given by the stomach to produce an equal effect.

CHAPTER II.

DOSAGE.

UR last topic in general technology is *dos-ge*, meaning matters connected with the *de-rmination* of doses of medicines. Here we ave first to consider certain principles that ap-ly generally, and secondly to note the cir-umstances under which ordinary doses must e specially modified. The general principles f dosage are best studied by examples. Let s first suppose a simple case: A woman is int, and we medicate to whip up the faltering eart. A teaspoonful of brandy circulating in e blood will ordinarily do the business, and a aspoonful of brandy is thereupon prescribed nd taken with, we will suppose, the expected ffect. Here the matter has been simple; e need for a medicinal influence was tran-ent, and, there being no objection, the full *uantity of* drug required for the effect was *ven* at once—here, that is, dose has been *de to equal* quantity necessary to be present.

within the system at a given time. But let us take another case: as a teaspoonful of brandy in the blood will oppose emotional heart-failure, so will twenty grains of quinine oppose an expected paroxysm of ague. Shall we, then, in such circumstance, give the quinine as we gave the brandy—all at once? Better not, if we can avoid it, for while in the stomach *in transitu* to the blood, such a considerable dose will be likely to nauseate. And we can avoid it, for this medicine, once absorbed, stays in the blood several hours, and the time of the disease-onset being known beforehand, we have hours at our disposal for the medicating. So we do what the military commandant does who must garrison with a strong force a fort whose approach is a weak bridge—*take time, and march the command across in small detachments;* we break up, that is, our heavy charge of quinine, and give it, as the phrase is, in *divided doses*—four grains, say, every half hour until five doses shall have been taken. The result is practically the same as if the whole had been given at once—the full garrison is present when the enemy attacks, and the assault is foiled. Next, a third case, where the conditions differ—conditions that may be paralleled in our illustration of the fort in this wise: The for

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equability are obvious, and often indeed the medication may wholly fail of its end unless this condition be fulfilled. Now such fulfilment is only possible by *frequency of reinforcement*, and thus obtains the important rule that, in continuous medication, after the system is once properly charged with the drug, *renewals are to be on the plan of "little and often," rather than of large doses at long intervals.* But in obeying the rule two points are to be considered: first, that the actual frequency of renewal will *vary greatly with different drugs* according to the persistence of their effects on the one hand and the rapidity of their elimination on the other. Thus the heavy metals are, so to speak, tenacious upon the tissues; their effects are prolonged, and their excretion slow. Such an influence, therefore, as constitutional mercurialization can be maintained at an even pitch by renewals not oftener than thrice, twice, or even by certain methods, once daily. On the contrary, flitting principles that swoop on the wing, as it were, like ethers and many alkaloids, must be repeated with great frequency. If a heart is to have its pulse-rate evenly depressed by aconite, the renewals must *be at least* hourly, otherwise the pulse-rate will *rise and fall* in a regular wave between dosings

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proper intervals. If the influence must be at all prolonged, the requisite percentage is first established by either of the foregoing methods, and then maintained by reinforcements made, preferably, small and frequent, the dose at each renewal being, of course, duly proportioned to the frequency.

The next point in dosage is a simple and obvious one. One grain of quinine appetizes; twenty grains deranges digestion but develops the new potence of reducing fever-heat. Both effects are utilizable therapeutically, but the *dose* for the different purposes differs enormously. With drugs of manifold therapeutic powers, therefore, *purpose* is an essential factor in estimating dose, the same drug having literally two or more "doses" according to the effect sought.

Such are the principles that regulate dosage in general, and we pass now to the independent consideration that even with the same drug, given in the same way and for the same purpose, the dose is not always the same. This may be because of a variety of reasons. In the first place, plainly, in constitutional medicating, bulk of remedy must bear relation to bulk of *patient*. The basis being, as we have seen, *the establishment* of a given percentage of drug

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dose at unity, the fraction thereof proper for a child of given age may be found by the formula:

$$\frac{\text{age}}{\text{age} + 12}$$

At age six, for instance, the fraction is $\frac{6}{6+12} = \frac{6}{18} = \frac{1}{3}$: *i.e.*, a child six years old takes one-third of the adult dose. *Cowling's* formula is, under the same premises:

$$\frac{\text{age at next birthday}}{24}$$

At present age six, that is, the formula gives the fraction $\frac{7}{24} = \frac{1}{3} -$: rather less than one-third. In general, with the younger ages, Cowling's formula yields a slightly smaller dosage than Young's; the one or the other may be used, therefore, according as we may wish scant or full dosing for the age.

But, apart from matter of size, there are many conditions—conditions of patient or of his environment—which may distinctly modify drug-influence, enhancing, enfeebling, or distorting, as the case may be. When such conditions obtain, doses must evidently be changed to suit. The more prominent of the conditions and their effects are as follows: First, *age*. Children are as a rule more susceptible to drug-influence than adults, though with a few drugs the

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become proportionately less

peculiarly common, necessitating exceptional caution in their prescription to stranger patients. Tobacco offers a well-known instance of this peculiarity, while of drugs proper, opium, ipecac, and mercury afford marked examples.

Next, *special physiological status* of the system generally or of some part concerned, often affects, and most profoundly, the influence of a drug. Thus, locally, a dirty, thick, or inflamed skin will absorb less perfectly than a clean, a thin, or a healthy one; a full stomach will be affected less by a medicine than an empty one, and in narcotic poisoning or in collapse even an empty stomach may refuse to absorb at all. On the other hand, if the local effect of a remedy be irritating, and the surface receiving the application be already irritated or inflamed, the local influence will be more intense than ordinary. Constitutionally, too, morbi states may throw out of gear, and most strangel the usual relation between dose and results. striking example is with narcotic drugs, whic by the very circumstances calling for their prescription, may require relatively enormous dosage to produce the needed effect—a dosage that ordinarily would be even fatal! [illegible] *collapse* from hemorrhage a quar

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APPENDIX.

TABLE OF THE SOLUBILITY OF CHEMICALS IN WATER AND IN ALCOHOL.

[*From the U. S. Pharmacopœia.*]

Abbreviations: s. = soluble; ins. = insoluble; sp. = sparingly; v. = very; alm. = almost dec. = decomposed.

Chemicals.	Water.		Alcohol.	
	At 15° C. (59° F.).	Boiling.	At 15° C. (59° F.).	Boiling.
One part is soluble in:	*Parts.*	*Parts.*	*Parts.*	*Parts.*
[illegible]m Arseniosum	30–80	15	sp.	sp.
Benzoicum	500	15	3	1
Boricum	25	3	15	5
Carbolicum	20	—	v. s.	v. s.
[illegible]omicum	v. s.	v. s.	dec.	dec.
[illegible]cum	0.75	0.5	1	0.5

SOLUBILITY OF CHEMICALS—*Contin*

S.	Water.		Al
	At 15° C. (59° F.).	Boiling.	At 15° C (59° F.
ble in:	*Parts.*	*Parts.*	*Parts.*
.....	100	3	4.5
.....	450	14	2.5
.....	6	v. s.	0.6
.....	0.7	0.5	2.5
.....	10.5	ins.	0.3
.....	20	ins.	0.7

" Phosphas	4	ins.	0.5	ins.
" Sulphas	1.3	1	sp.	sp.
" Valerianas	v. s.	v. s.	v. s.	v. s.
Antimonii et Potassii Tartras	17	3	ins.	ins.
" Oxidum	alm. ins.	alm. ins.	ins.	ins.
" Sulphidum	ins.	ins.	ins.	ins.
" Sulphidum Purificatum	ins.	ins.	ins.	ins.
Antimonium Sulphuratum	ins.	ins.	ins.	ins.
Apomorphinæ Hydrochloras	6.8	dec.	50	dec.
Argenti Cyanidum	ins.	ins.	ins.	ins.
" Iodidum	ins.	ins.	ins.	ins.
" Nitras	0.8	0.1	26	5
" " Fusus	0.6	0.5	25	5
" Oxidum	v. sp.	v. sp.	ins.	ins.
Arsenii Iodidum	3.5	dec.	10	dec.
Atropina	600	35	v. s.	v. s.
Atropinæ Sulphas	0.4	v. s.	6.5	v. s.
Bismuthi Citras	ins.	ins.	ins.	ins.
" et Ammonii Citras	v. s.	v. s.	sp.	sp.
" Subcarbonas	ins.	ins.	ins.	ins.
" Subnitras	ins.	ins.	ins.	ins.

SOLUBILITY OF CHEMICALS—*Conti*

LS.	Water.		A
	At 15° C. (59° F.).	Boiling.	At 15° (59° F
uble in:	*Parts.*	*Parts.*	*Part*
.....	33	—	dec
.....	75	9.5	35
.....	0.7	v. s.	1
atus.....	ins.	ins.	ins
.....	1.5	v. s.	8
	6.8	6	in

Cinchoninæ Sulphas	70	14	6	1.5
Codeina	80	17	v. s.	v. s.
Creta Præparatâ	ins.	ins.	ins.	ins.
Cupri Acetas	15	5	135	14
" Sulphas	2.6	0.5	ins.	ins.
Elaterinum	ins.	ins.	125	2
Ferri Chloridum	v. s.	v. s.	v. s.	v. s.
" Citras	s.	v. s.	ins.	ins.
" et Ammonii Citras	v. s.	v. s.	ins.	ins.
" " " Sulphas	3	0.8	ins.	ins.
" " " Tartras	v. s.	v. s.	ins.	ins.
" " Potassii Tartras	v. s.	v. s.	ins.	ins.
" " Quininæ Citras	s.	v. s.	ins.	ins.
" " Strychninæ Citras	v. s.	v. s.	ins.	ins.
" Hypophosphis	sp.	sp.	ins.	ins.
" Lactas	40	12	alm. ins.	alm. ins.
" Oxalas	sp.	sp.	ins.	ins.
" Oxidum Hydratum	ins.	ins.	ins.	ins.
" Phosphas	v. s.	v. s.	ins.	ins.
" Pyrophosphas	v. s.	v. s.	ins.	ins.
" Sulphas	1.8	0.3	ins.	ins.

OLUBILITY OF CHEMICALS—*Continue*

	Water.		Alcoh
	At 15° C. (59° F.).	Boiling.	At 15° C. (59° F.).
in :	*Parts.*	*Parts.*	*Parts.*
.....	1.8	0.3	ins.
.....	ins.	dec.	v. s.
osivum	16	2	3
e	ins.	ins.	ins.
.....	12.8	3	15
m	alm. ins.	alm. ins.	130
.....	alm. ins.	alm. ins.	ins.
n	ins.	ins.	ins.
	ins.	ins.	ins.

lum	sp.	—	11	—
hii Benzoas	4	2.5	12	10
" Bromidum	v. s.	v. s.	v. s.	v. s.
" Carbonas	130	130	ins.	ins.
" Citras	5.5	2.5	sp.	sp.
" Salicylas	v. s.	v. s.	v. s.	v. s.
gnesia	alm. ins.	alm. ins.	ins.	ins.
" Ponderosa	alm. ins.	alm. ins.	ins.	ins.
gnesii Carbonas	alm. ins.	alm. ins.	ins.	ins.
" Sulphas	0.8	0.15	ins.	ins.
" Sulphis	20	19	ins.	ins.
ngani Oxidum Nigrum	ins.	ins.	ins.	ins.
" Sulphas	0.7	0.8	ins.	ins.
orphina	v. sp.	500	100	36
orphinæ Acetas	12	1.5	68	14
" Hydrochloras	24	0.5	63	31
" Sulphas	24	0.75	702	144
hosphoras	ins.	ins.	v. sp.	v. sp.
hysostigminæ Salicylas	130	30	12	v. s.
icrotoxinum	150	25	10	3
arpinæ Hydrochloras	v. s.	v. s.	v. s.	v. s.

LUBILITY OF CHEMICALS—*Continued*

	Water.		Alcoho
	At 15° C. (59° F.).	Boiling.	At 15° C. (59° F.).
	Parts.	*Parts.*	*Parts.*
.....	alm. ins	alm. ins.	30
.....	1.8	0.5	8
.....	ins.	ins.	ins.
.....	2000	200	v. sp.
.....	2	0.8	alm. ins

" Citras	0.6	v. s.	v. sp.	v. sp.
" Cyanidum	2	1	sp.	sp.
" et Sodii Tartras	2.5	v. s.	alm. ins.	alm. ins.
" Ferrocyanidum	4	2	ins.	ins.
" Hypophosphis	0.6	0.3	7.3	3.6
" Iodidum	0.8	0.5	18	6
" Nitras	4	0.4	alm. ins.	alm. ins.
" Permanganas	20	3	dec.	dec.
" Sulphas	9	4	ins.	ins.
" Sulphis	4	5	sp.	sp.
" Tartras	0.7	0.5	alm. ins.	alm. ins.
Quinidinæ Sulphas	100	7	8	v. s.
Quinina	1600	700	6	2
Quininæ Bisulphas	10	v. s.	32	v. s.
" Hydrobromas	16	1	3	1 or less.
" Hydrochloras	34	1	3	v. s.
" Sulphas	740	30	65	3
" Valerianas	100	40	5	1
.....	0.5	0.2	175	28
ctis	7	1	ins.	ins.
.....	28	0.7	30	2

SOLUBILITY OF CHEMICALS—*Conti*

LS.	WATER.		A
	At 15° C. (59° F.).	Boiling.	At 15° (59° F
uble in :	*Parts.*	*Parts.*	*Parts*
.....	V. S.	V. S.	V. S
.....	ins.	ins.	ins.
.....	ins.	ins.	ins.
.....	0.6	0.3	ins.
.....	100	—	40

INDEX.